CLAIMS

What is claimed is:

1. A protein-based composition for preventing or treating infection by a pathogen, comprising a compound that comprises:

at least one therapeutic domain comprising a peptide or protein, wherein said at least one therapeutic domain has at least one extracellular activity that can prevent the infection of a target cell by a pathogen; and

at least one anchoring domain comprising a peptide or protein, wherein said anchoring domain can bind at or near the surface of a eukaryotic cell.

2. The composition of claim 1, wherein said anchoring domain can bind at or near the surface of an epithelial or endothelial cell.

3. The composition of claim 2, wherein said anchoring domain can bind at or near the surface of an epithelial cell.

4. The composition of claim 3, wherein said anchoring domain binds an epithelial cell surface molecule.

5. The composition of claim 4, wherein said epithelial cell surface molecule is a glycosaminoglycan.

6. The composition of claim 5, wherein said anchoring domain can bind heparin or heparan sulfate.

7. The composition of claim 6, wherein said anchoring domain is a peptide.

8. The composition of claim 7, wherein said peptide comprises a GAG-binding amino acid sequence of a naturally-occurring protein, or a sequence that is substantially homologous to the GAG-binding sequence of a naturally-occurring protein.

9. The composition of claim 8, wherein said peptide comprises the GAG-binding amino acid sequence of a mammalian protein.

10. The composition of claim 9, wherein said peptide comprises the GAG-binding amino acid sequence of a human protein.

11. The composition of claim 10, wherein said peptide comprises an amino acid sequence substantially homologous to the amino acid sequence of **SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6,** or **SEQ ID NO:7.**

12. The composition of claim 11, wherein said comprises the GAG-binding amino acid sequence of human platelet factor 4 (**SEQ ID NO:2**), human interleukin 8 (**SEQ ID NO:3**), human antithrombin III (**SEQ ID NO:4**), human apoprotein E (**SEQ ID NO:5**), human angio-associated migratory protein (**SEQ ID NO:6**), or human amphiregulin (**SEQ ID NO:7**).

13. The composition of claim 1, wherein said pathogen is a virus.

14. The composition of claim 13, wherein said virus is an influenza virus.

15. The composition of claim 14, wherein said influenza virus is an influenza A or an influenza B virus.

16. The composition of claim 13, wherein said at least one therapeutic domain comprises a protease inhibitor.

17. The composition of claim 16, wherein said protease inhibitor inhibits an enzyme involved in processing a viral protein.

18. The composition of claim 17, wherein said enzyme involved in processing a viral protein is a host enzyme.

19. The composition of claim 18, wherein said protease inhibitor is a serine protease inhibitor.

20. The composition of claim 19, wherein said protease inhibitor is aprotinin, leupeptin, soybean protease inhibitor, e-aminocaproic acid, or n-p-tosyl-L-lysine.

21. The composition of claim 20, wherein said protease inhibitor is aprotinin.

22. The composition of claim 1, wherein said therapeutic domain is an enzyme or an active portion thereof.

23. The composition of claim 22, wherein said therapeutic domain is a sialidase.

24. The composition of claim 20, wherein said sialidase is substantially homologous to at least a portion of at least one viral sialidase, at least one bacterial sialidase, or at least one eukaryotic sialidase.

25. The composition of claim 24, wherein said sialidase is substantially homologous to at least a portion of at least one bacterial sialidase.

26. The composition of claim 25, wherein said sialidase is substantially homologous to at least a portion of a bacterial sialidase that can cleave a sialic acid alpha, 2-6 linkage and a sialic acid alpha 2-3 linkage.

27. The composition of claim 26, wherein said sialidase is substantially homologous to at least a portion of *Vibrio cholerae* sialidase, *Clostridium perfringens sialidase*, *Actinomyces viscosus* sialidase, or *Micromonospora viridifaciens* sialidase.

28. The composition of claim 27, wherein said sialidase is substantially homologous to at least a portion of *Clostridium perfringens* sialidase, *Actinomyces viscosus* sialidase, or *Micromonospora viridifaciens* sialidase.

29. The composition of claim 28, wherein said sialidase is substantially homologous to at least a portion of *Clostridium perfringens* sialidase, *Actinomyces viscosus* sialidase, or *Micromonospora viridifaciens* sialidase.

30. The composition of claim 29, wherein said sialidase comprises at least a portion of the sequence of *Clostridium perfringens* sialidase, *Actinomyces viscosus* sialidase, or *Micromonospora viridifaciens* sialidase.

31. The composition of claim 24, wherein said sialidase is substantially homologous to at least a portion of at least one eukaryotic sialidase.

32. The composition of claim 31, wherein said sialidase is substantially homologous to at least a portion of at least one human sialidase.

33. The composition of claim 32, wherein said sialidase is substantially homologous to at least a portion of NEU1, NEU3, NEU2, or NEU4.

34. The composition of claim 33, wherein said sialidase is substantially homologous to at least a portion of NEU2 **(SEQ ID NO:8)**, or NEU4 **(SEQ ID NO:9)**.

35. The composition of claim 1, further comprising at least one peptide linker that links said at least anchoring domain to said at least one therapeutic domain.

36. The composition of claim 35, wherein said at least one peptide linker comprises between one and one hundred amino acids.

37. The composition of claim 36, wherein said at least one peptide linker comprises at least one glycine residue.

38. The composition of claim 37, wherein said at least one peptide linker comprises the sequence (GGGGS)n, where n is a whole number from 1 to 20.

39. The composition of claim 38, wherein said at least one peptide linker comprises the sequence (GGGGS)n, where n is a whole number from 1 to 12.

40. The composition of claim 1, wherein at least one anchoring domain is one anchoring domain.

41. The composition of claim 40, wherein said anchoring domain is N- terminal to said at least one therapeutic domain.

42. The composition of claim 40, wherein said anchoring domain is C- terminal to said at least one therapeutic domain.

43. The composition of claim 1, wherein at least one anchoring domain is at least two anchoring domains.

44. The composition of claim 43, wherein at least one of said at least two anchoring domains is N-terminal to said at least one therapeutic domain and at least one of said at least two anchoring domains is C-terminal to said at least one therapeutic domain.

45. The composition of claim 45, wherein said at least two anchoring domains and said at least one therapeutic domain are connected by peptide linkers.

46. The composition of claim 1, wherein at least one therapeutic domain is at least two therapeutic domains.

47. A pharmaceutical formulation comprising the composition of claim 1.

48. The pharmaceutical formulation of claim 47, formulated as a spray.

49. The pharmaceutical formulation of claim 47, formulated as an inhalant.

50. A method of treating or preventing influenza infection, comprising:
applying a therapeutically effective amount of the composition of claim 1 to epithelial cells of a subject.

51. The method of claim 50, wherein said applying is by use of a nasal spray.

52. The method of claim 50, wherein said applying is by use of an inhaler.

53. The method of claim 52, wherein said applying is performed from once to four times a day.

54. A method of using a sialidase to prevent or impede infection by a pathogen, comprising:
providing a composition that comprises at least one sialidase;
applying a therapeutically effective amount of said composition to epithelial cells of a subject.

55. The method of claim 54, wherein said sialidase is substantially homologous to at least a portion of at least one viral sialidase, at least one bacterial sialidase, or at least one eukaryotic sialidase.

56. The composition of claim 55, wherein said sialidase is substantially homologous to at least a portion of at least one eukaryotic sialidase.

57. The composition of claim 56, wherein said subject is a human subject, and said sialidase is substantially homologous to at least a portion of at least one human sialidase.

58. The composition of claim 57, wherein said sialidase is substantially homologous to at least a portion of NEU2 (**SEQ ID NO:8**), or NEU4 (**SEQ ID NO:9**).

59. The method of claim 54, wherein said applying is by use of a nasal spray.

60. The method of claim 54, wherein said applying is by use of an inhaler.